

## San Luis Pass

San Luis Pass is a tidal inlet between Follets Island and Galveston Island (**fig. 1**). A tidal inlet is a channel that carries water into or out of a bay as water levels change owing to the rise and fall of the tides. Tidal inlets facilitate the exchange of water between the ocean and a bay or lagoon. Tidal inlets allow fish and shrimp and other marine organisms to enter and leave the bay or lagoon, and they are used by ships and smaller boats. San Luis Pass is one of two stable, natural tidal inlets on the Texas coast. The other is Pass Cavallo between Matagorda Island and western Matagorda Peninsula. San Luis Pass naturally maintains a channel that is not dredged but that migrates within the tidal inlet. Most of the other major tidal inlets on Gulf of Mexico coast are sites of sediment deposition and must be dredged to maintain sufficient depth for boat traffic as well as have had jetties constructed to stabilize the inlet entrance.



**Figure 1.** San Luis Pass looking toward Galveston Island.

During high tide water level is higher in the ocean than in the bay, and water pours into the bay. When the tide is low, the water in the bay is higher than in the ocean, and water rushes through a tidal inlet to the ocean. All that water escaping from or racing into a bay creates a current, and moving water means erosion and transportation of

sediments. The current velocities are highest where the channel is narrow and slow down as the waters spread out in a bay (during a high tide, or flood tide) or in the ocean (during a low tide, or ebb tide). In an active tidal inlet, sediments are eroded and transported through the pass and then deposited at either end of the pass (**fig. 2**). The sediment deposited near the mouth of a tidal inlet in a bay or lagoon by a flood tide is called a **flood-tidal delta**. The sediment deposited near the mouth of a tidal inlet in the ocean by an ebb tide is called an **ebb-tidal delta**. At San Luis Pass, sediment transported through the inlet by a rising (flood) tide is deposited in Galveston West Bay; sediment washed through the channel as waters recede during a falling (ebb) tide is deposited on the Gulf of Mexico end of the pass (**fig. 2**). There is a **flood-tidal delta** in West Bay and an **ebb-tidal delta** in the Gulf of Mexico.



**Figure 2.** Map of San Luis Pass showing the position of the ebb- and flood-tidal deltas.

The currents through the tidal inlets can be very dangerous because they fluctuate in velocity and change directions throughout the day. Depending on when you visit, you may see a strong current running from the open Gulf of Mexico or from West Bay. The current changes direction with the tides. As the level of the Gulf rises toward high tide (flood tide), water flows into West Bay through San Luis Pass: as water level recedes toward low tide (ebb tide), water flows through the inlet out of West Bay into the Gulf. The tidal range, the vertical distance between water levels at high and low tide, is less than 2 feet on the Texas coast but a large volume of water sweeps through the tidal inlet with each changing of the tide. The current velocities are highest where the channel is narrow and slow down as the waters spread out in West Bay (flood tide) or in the Gulf of Mexico (ebb tide).

The waters that flow through a tidal inlet may carry a large amount of sediment. Where the current velocities slow down (go from higher energy in the channel to lower energy in the larger body of water), sediments are deposited in a fan-shaped “delta” of sediment. An ***ebb-tidal delta*** is the fan-shaped body of sediment deposited in the ocean by currents related to water draining through a channel as water level in the bay decreases during an ebb tide. A ***flood-tidal delta*** is the fan-shaped body of sediment deposited in a bay or estuary by currents related to waters flowing through a channel during a flood tide (**fig. 3**). These large sediment bodies are often used for beach nourishment projects on adjacent beaches.

Tidal inlets form, migrate, close, and reopen as a result of natural processes. Many tidal inlets between barrier islands were formed as washover channels, a channel cut across a barrier island by elevated water levels caused by storm surge. Most newly formed washover channels are filled by deposits of sediment over a few days, weeks or months. However, if the tidal currents are sufficient to keep the channel open, a new tidal inlet is formed. The amount of water passing through a tidal inlet depends on

- the height of the tides (tidal range),
- the volume of water in the bay or lagoon,
- the size and number of tidal passes that drain a given bay or lagoon.



**Figure 3.** San Luis Pass looking from West Bay to the Gulf of Mexico. Lighter colored areas in the bay are flood-tidal delta deposits. The dark colored area through the pass is the main channel through which the tidal currents flow.

Hundreds of tidal inlets, small and large, occur along the Gulf of Mexico coast from Texas to Florida. Tidal inlets:

- may be stable for centuries or close in a few days as a result of a large storm.
- are important for the transfer of water between the ocean and bays and lagoons.
- are essential for biologic communities—adult creatures from the ocean enter bays and lagoons to breed, and their young return to the ocean through tidal inlets.

Because San Luis Pass does not have jetties, the shoreline on either side of the pass are very dynamic. Shoreline position is affected by the position of the main channel through which tidal currents flow (**fig. 3**). The position of the main channel has been mapped by looking at historical aerial photography (**fig. 4**). Despite the migration of the



main tidal channel, the opening of the inlet has remained in a stable position since the 1930's. The location of the main tidal channel within San Luis Pass does impact the position of the shoreline on Galveston and Follets Islands.

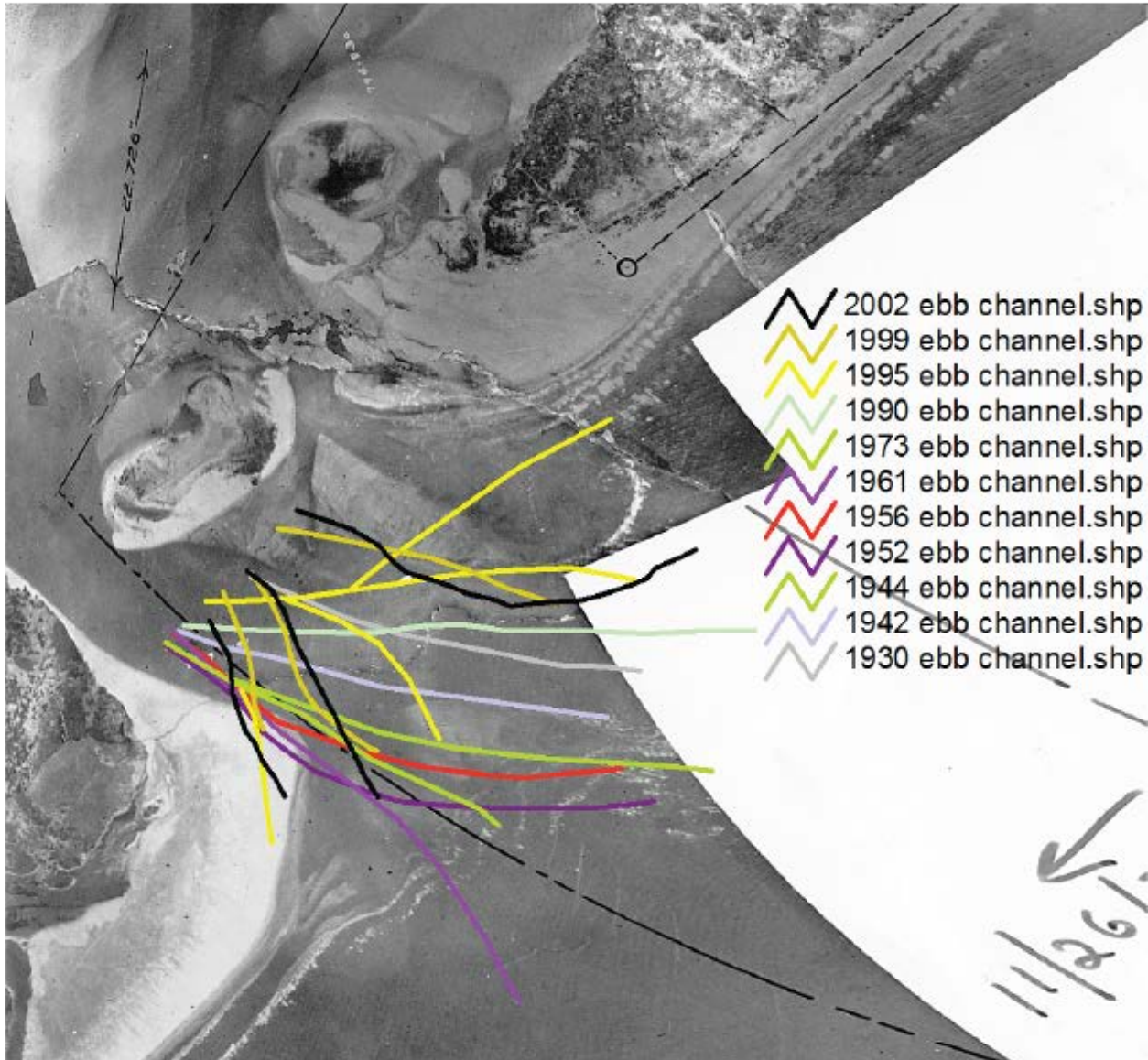


Figure 4. Migration of the San Luis Pass main tidal channels between 1930 and 2002 mapped from historical aerial photography. (Figure courtesy of James Gibeaut)